effectiveness of various diets in decreasing the hepatic lipid in the presence of common duct obstruction in the dog. The data may be summarized by stating that a high carbohydrate-high protein diet is twice as effective in this respect as is a high carbohydrate diet alone, given in the same number of calories per kilogram of body weight per day. In conditioning the liver to minimal injury, or in providing for repair subsequent to injury, it is necessary that a diet of suitable composition be administered and that the total caloric intake be adequate for the energy requirements of the individual and for providing for the replenishment of the depleted storehouses of body foodstuffs.

Best, Channon, and their coworkers[22] have reported, and we have confirmed their findings, that a high protein diet is conducive to a lesser deposition of hepatic lipid. The level of hepatic lipid and glycogen are from our data markedly affected by the amount of protein in the diet.

The hypotheses which assume that glycogen *per se* is effective in protecting the liver against the action of chloroform receive no support from our data. It protects if, during its deposition in the liver, the concentration of liver lipid is reduced, and probably is, as the result of an adequate store of glycogen, it spares the hepatic stores of protein.

Studies we are now making in man confirm the data we have obtained from the rat and dog, that a high carbohydrate-high protein dietary is the most efficient in conditioning a liver with adequate glycogen, low lipid and high protein concentrations. It is, we believe, the type of diet which will result in minimal injury and provide for rapid repair of existing injury when the liver is exposed to a variety of hepatotoxic agents.

We believe that if food can be taken by mouth this is the best method of obtaining the desired objective. If the patient will not eat the necessary amount, or if it is desirable that food not be placed in the stomach, the orojejunal method which Stengel and I[23] have described provides an efficient means of introducing sufficient calories of suitable composition. Where it is desired rapidly to replenish depleted stores of protein in the plasma or tissues, we believe that the intravenous injection of plasma is at present the most effective means of obtaining this. The intravenous injection of plasma is not attended by the postinjection reactions that so frequently follow the use of serum. We have administered intravenously amino-acid mixtures, made from the hydrolysis of casein and soy bean, reinforced with tryptophan, cystein and methionin; and while we have kept the dog and man in positive nitrogen balance there has been no evidence that the total plasma or liver protein, or the protein concentration of the plasma was replenished following a period of protein depletion.

A better understanding of these and many other problems of nutrition, which are constantly present in surgical patients, will lead to a further reduction in the morbidity and mortality of anesthesia and operation in a wide variety of conditions.

The nutritional state of the individual has been considered to bear some relationship to general resistance. I hope that I have shown you that the part which it plays is much more important than is generally supposed. Such serious complications as failure of a gastro-enteric stoma to empty, wound disruption, or serious hepatic necrosis, can in large part be prevented by restoring the storehouses of protein prior to operation and maintaining them after operation.

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HISTORY OF THE ANESTHETIC DEPARTMENT AT LANE STANFORD UNIVERSITY HOSPITAL IN SAN FRANCISCO*

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LANE HOSPITAL was built in 1893 by Dr. Levi Cooper Lane on land donated by Captain James M. McDonald. The Hospital was under the supervision of a committee from the faculty of Cooper Medical College until 1912. At this time formal transfer was made to Leland Stanford, Jr., University, and the entire faculty was retained as a part of the new hospital staff. All activities of the Hospital were under the control of the Clinical Committee from the Medical Department of the University.

BEGINNING OF THE DEPARTMENT ON ANESTHESIA

Dr. Henry Gibbons, then dean of the Cooper Medical School, had asked Dr. Caroline B. Palmer, a graduate of the class of 1906, to take charge of

* Chairman's address before the Section on Anesthesiology of the California Medical Association at the sixty-ninth annual session, Coronado, May 6-9, 1940.

the administration of anesthetics. This step was made in 1909 toward the formation of a regular department in anesthesia because of Doctor Gibbons' concern over some fatalities which had occurred. Doctor Palmer acted in that capacity as head of the department for twenty-eight years, reaching her age for retirement in September, 1937.

Doctor Palmer's first interest in anesthesia began as a medical student at the San Francisco County Hospital, when she saw a patient die during induction. She felt that anything as important as anesthesia should have more serious attention than it was receiving in those days. Diligent study and close observation of anesthetics, given by Dr. Mary Botsford, qualified Doctor Palmer to administer many anesthetics during her internship at the Children's Hospital in San Francisco between 1906 and 1907.

After her appointment at Cooper, she visited all major medical centers where anesthetics were given. In this manner she became acquainted with the work of Dr. Isabella Herb in Chicago, of Dr. Gwathmey in New York, and of Dr. Richardson, the so-called Dean of Anesthesia, in Boston.

She also gained a thorough knowledge of all anesthetic agents by inspecting different manufacturing plants. At E. R. Squibb and Sons, in New York, she met Doctor Ferguson, who was in charge of their anesthetic department, and was given access to his personal library on anesthesia, then the largest in the United States.

Doctor Palmer took advantage of every opportunity available in this country to further her knowledge of the art of practicing anesthesiology as a medical specialty, and to qualify herself to train other doctors to become specialists in this field.

The proper psychic preparation of every patient was always stressed by Doctor Palmer. She believed and taught that the carefully regulated dosage of a hypodermic was a part of the anesthetic. Practically all patients received a hypodermic injection of morphin sulphate and atropin; but this did not include those under five and over seventy.

EXPERIENCES WITH VARIOUS ANESTHETICS

In the early days, heroin was used when the patient was said to be unable to tolerate morphin. Scopolamin, replacing atropin for a period of years beginning about 1924, was favored by some surgeons.

In June, 1929, a barbiturate was first introduced into the list of premedication agents; it was sodium amytal, used only intravenously. The clinical experiences at Stanford with it as an auxiliary anesthetic were published in the *American Journal of Surgery* in July, 1930. But its intravenous use was soon discontinued, because of the lengthened and complicated postoperative nursing care required. Later the oral administration of other sedatives gave more satisfactory results; these preparations were sodium amytal, luminal, allonal, nembutal, seconal, and barbital. For a period barbital was given alone or combined with sodium bromid. Sodium luminal, hypodermically, was used when ingestion of any drug was contraindicated.

In 1932, avertin, or tribromethanol, was employed to produce basal anesthesia in combination with local infiltration or with nitrous oxid-oxygen. In brain surgery ether vapor was used, and then this was replaced by local infiltration of novocain. Latterly, since its introduction, all major brain surgery is done under avertin combined with local novocain.

Paraldehyd given by rectum was used for a short period in gynecologic surgery, but was replaced by avertin or by scopolamin. Since 1936, paraldehyd has been used advantageously by several otolaryngologists for tonsillectomies. Some evipal, intravenously and rectally, and pentothal sodium has been used since 1934. Morphin sulphate and scopolamin, in a single dose, is given one and one-half hours before operation, or, in divided doses, two and one-half and one and one-half hours before the use of the more potent cyclopropane anesthetic agent.

Dr. R. L. Rigdon began the use of spinal anesthesia in genito-urinary surgery at Stanford in 1919. Tropococain was the drug used. This was later replaced by neocain and by novocain and pantocain. Spinal anesthesia was only occasionally used before 1929; after which time its popularity increased. The reasons for this were the preliminary use of ephedrin and, later, the control of the level of anesthesia by raising or lowering the head of the operating table.

HOW RECORDS WERE KEPT

The first records of anesthetics administered were written in ordinary student notebooks. In December, 1917, the first book of printed reports in duplicate was used. This was at the suggestion of Dr. Emmet Rixford. The form was designed after a study of records in use in the larger hospitals in the country at that time. Through the years modifications were made according to the changes in methods of administration and in operative procedures. The one in current use has complete pre- and postoperative information on the reverse side, and is filed in special departmental files.

COSTS OF ANESTHETIC AGENTS

In the early days ether was commonly used because of the prohibitive cost to the patient of anesthetic gases. Chloroform was used only upon the insistence of the surgeon. Doctor Palmer, early in her career, believed that the addition of oxygen to ether was less irritating and better for the patient than ether dropped on a mask. The earliest method of administering ether vapor was by using a hand bulb to force air through a large Erlenmeyer flask of ether held on the anesthetist's lap. Later a foot bellows replaced the hand bulb, and the flask was set in a depression on top of a wooden stool. Realizing that a better arrangement could be made, Doctor Palmer designed a vapor machine in which oxygen, in a low pressure cylinder of 125 gallons, was used. There was an inlet for the use of compressed air when it was available. A Murphy drip bulb placed in the tubing leading to the patient prevented liquid ether from being given accidentally. One cylindrical bottle contained water in the event

that oxygen was to be given without ether. The other cylindrical bottle and flask, with a larger evaporating surface, contained ether, so that a stronger concentration could be produced without heating the ether. This measure was taken to prevent the formation of irritating aldehyds and ketones. For an improved vapor machine, Doctor Palmer later utilized the high-pressure controls on the Ohio monovalve machines. Four high-pressure cylinders, containing 130 gallons each, were used. Two of these contained 100 per cent oxygen and two contained a mixture of carbon dioxid and oxygen. The three glass containers and Murphy drip bulb were retained. Ether vapor was commonly introduced through a hook in the mouth or a nasal catheter, but by designing a special perforated mask Doctor Palmer made its use adaptable for major surgery. The administration of nitrous oxid, with adequate oxygen, to young children (the youngest two months old) has been safely conducted at Stanford for many years.

OTHER OBSERVATIONS

One of the early improvements in anesthetic procedures was attention to posture of the patient on the operating table. Positions which facilitated operating and protection against nerve injuries, or those unduly tiring to the patient, were developed and used by Doctor Palmer. Beginning supportive measures early, by maintaining body fluids and by preventing heat loss, operative shock was kept down to a minimum. Special protective care has always been taken in transferring patients to and from operating rooms.

The first administrations of nitrous oxid were with a White dental machine. Oxygen, when added, was given by means of a catheter in the nose or by a hook in the corner of the mouth. Cylinders were used which contained one hundred gallons and cost $3 each.

A first model Teter machine was purchased which would enable oxygen to be given simultaneously with nitrous oxid. There was no mixing chamber—each gas being allowed to flow to the patient independently through a single tube and face inhaler.

There was always great objection to the cost of anesthetic gases. These were first obtainable on the Pacific Coast only in small cylinders. About this time Doctor Botsford went to Cleveland to attend the clinics of Doctor Crile, who was doing operations under gas and oxygen. While there she visited the Ohio Company and found that gas in large cylinders could be sent to San Francisco at half the cost per gallon of that in the small cylinders. So it was arranged that the gas should be shipped from Ohio, and the cylinders received were stored in the basement of the apartment building where Doctor Palmer resided. After two years a distributing office was opened in San Francisco. Eighty dollars for a cylinder containing 3,200 gallons was paid for those sent to California from Ohio.

In 1924, Dr. Donald Baxter began the manufacture of nitrous oxid in Glendale. Doctor Palmer visited his plant and was satisfied that the quality was equal, if not superior, to that then in use. A price of $54 a cylinder, plus the freight charge, was paid. After Doctor Baxter established the Certified Laboratories Products Company in San Francisco, the price was reduced to $40 a cylinder on a contract with Stanford. As the cost of manufacture lessened, the price of nitrous oxid became lower, until it is now about $23 a cylinder.

The original charge to the patient was $10 an hour. The business manager of the Hospital complained to Doctor Somers, then the medical director, that $200 had been spent on gas in the year 1911, but the monthly report showed that more than that amount had been received by the Hospital. By using the tailings for induction, a surplus developed so that one of the sources of income for the Hospital was from this charge. The cost to the patient was then reduced to $6 an hour. After the introduction in 1935, and the increase in use of the absorption technique, a further saving was possible, allowing another reduction in charge for gas. A blanket charge of $2.50 is now made for every anesthetic procedure exclusive of locals.

Many times patients whose physical condition required a less toxic agent could not receive it because of the prohibitive price. The blanket charge at present assures a satisfactory income to the Hospital to cover the cost of machines, equipment, and agents. Thus an enviable goal has been reached. Every patient can now receive the agent or agents best suitable to his physical condition and the operative procedure, without being hampered by the question of cost.

In conclusion, permit me to quote from Doctor Palmer's chairman's address in 1933 on "The Future of Anesthesiology as a Medical Specialty": "The members of the anesthetic department in the institution with which I have the honor to be connected have reason to feel fortunate in the attitude toward anesthesiology of the medical school authorities, surgeons, internists, and hospital executives."

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EARLY CARE OF SEVERE THERMAL INJURIES*

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SEVERE thermal injuries are of rather frequent occurrence on large emergency hospital services, and they occur often enough in private and industrial practice to deserve the attention of surgeons everywhere. One may review the contributions made in the past few years by surgeons and physiologists and say, with confidence, that much has been done to improve both the local and the general aspects of the care of burned patients. To these contributors we must acknowledge a debt, and to them we look for further progress in the future.

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